

# Where to find spatial data



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# 1. Introduction

## 1.1. Background

The aim of this session is to highlight a number of places where you can access spatial data for use in GIS. Where appropriate we'll show how to use the data in QGIS.

## 1.2. Requirements

QGIS - current LTR (3.22.11 at time of writing): <https://www.qgis.org/>

A Digimap account: <https://digimap.edina.ac.uk/>

## 2. Digimap

<https://digimap.edina.ac.uk>

Digimap has a large volume of data for Great Britain, which is free to view and download for all staff and students at the University of Edinburgh. The data is organised in to the following 'Collections':

- **Ordnance Survey:** contemporary OS map data back to 1990s
- **Historic:** Historical OS map data back to 1850s
- **Geology:** range of geological data from British Geological Survey
- **Marine:** marine data and Hydrographic Office charts from OceanWise
- **Environment:** Land-use data from Centre for Hydrology and Ecology
- **Aerial:** aerial photography from Getmapping (multiple years)
- **Lidar:** Lidar data from English, Welsh and Scottish environment agencies for 3D landscapes
- **Global:** global data from OpenStreetMap and Natural Earth
- **Census:** census data from 2011 Censuses of Population
- **Verisk:** detailed data from commercial data provider Verisk
- **agCensus:** data derived from the regular Agricultural Censuses of England, Scotland and Wales

**Digimap**

Please log in to access applications. [How?](#) [Log In](#)

Ordnance Survey Historic Geology Marine Environment Aerial Lidar Global Society Pilot Geomni **agCensus** Notable

**Historic Collection** gives rich historical mapping for multiple epochs dating back to the 1840s, invaluable for Digital Humanities and understanding change over time. [Learn More](#)

**What is Digimap?**

Digimap is an online map and data delivery service, available by subscription to UK Higher and Further Education establishments. Operated by EDINA at the University of Edinburgh, Digimap offers a number of data collections, including Ordnance Survey, historical, geological, LiDAR and marine maps and spatial data.

**What are we offering?**

Digimap offers access to a range of datasets for the purposes of education and research. Create or interrogate a map online by selecting an appropriate base map, adding annotations and customising the content, use measurement and query tools to learn more about any study area. Download the raw spatial data in a wide range of formats for use in local GIS, CAD or image processing software.

**Subscription Information**

Digimap is available to members of subscribing higher and further education institutions in the UK. Individual registration is required, but the service is free at the point of use. More information about subscription fees can be found on our [website](#).

EDINA

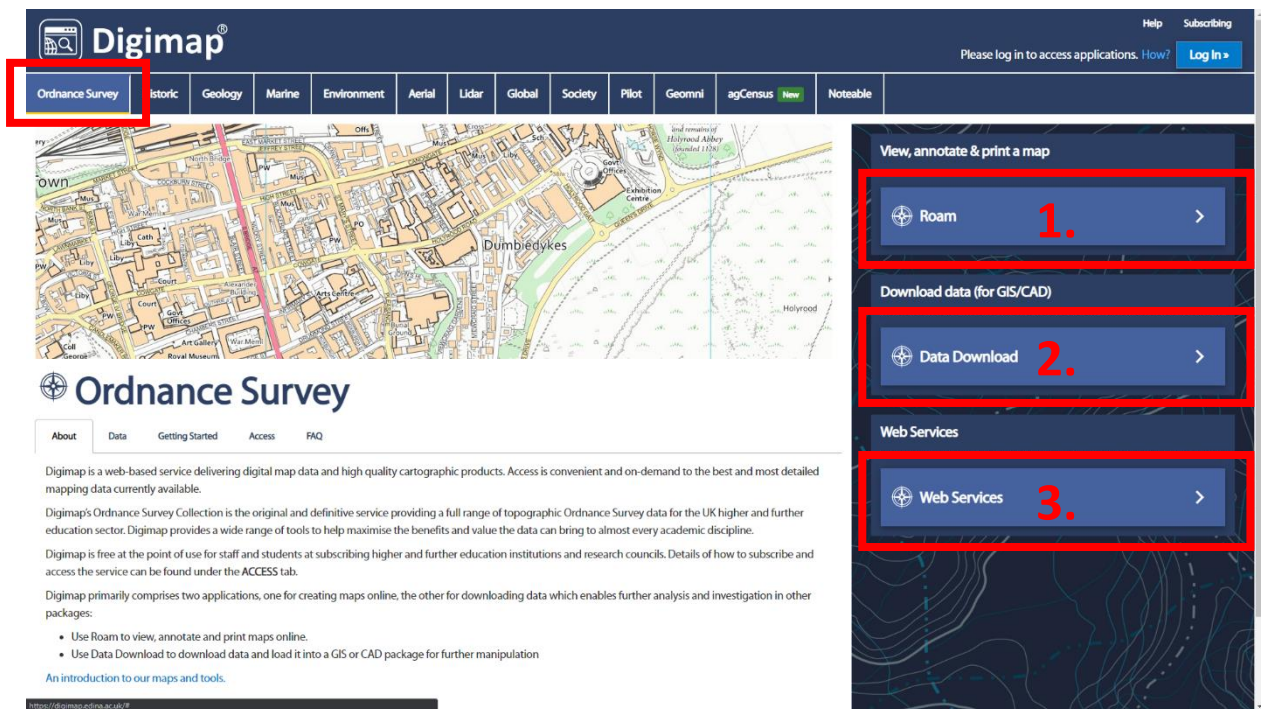
[Contact Us](#) [Privacy Notice](#) [Cookie Policy](#) [Accessibility Statement](#)

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### Key points:

- Access is free to all staff and students at UoE.
- Data can only be used for academic work; it **must not** be used for any commercial work.
- The appropriate copyright statement must be included with all maps/images made using any data from Digimap.

There are three main applications in each 'Collection':

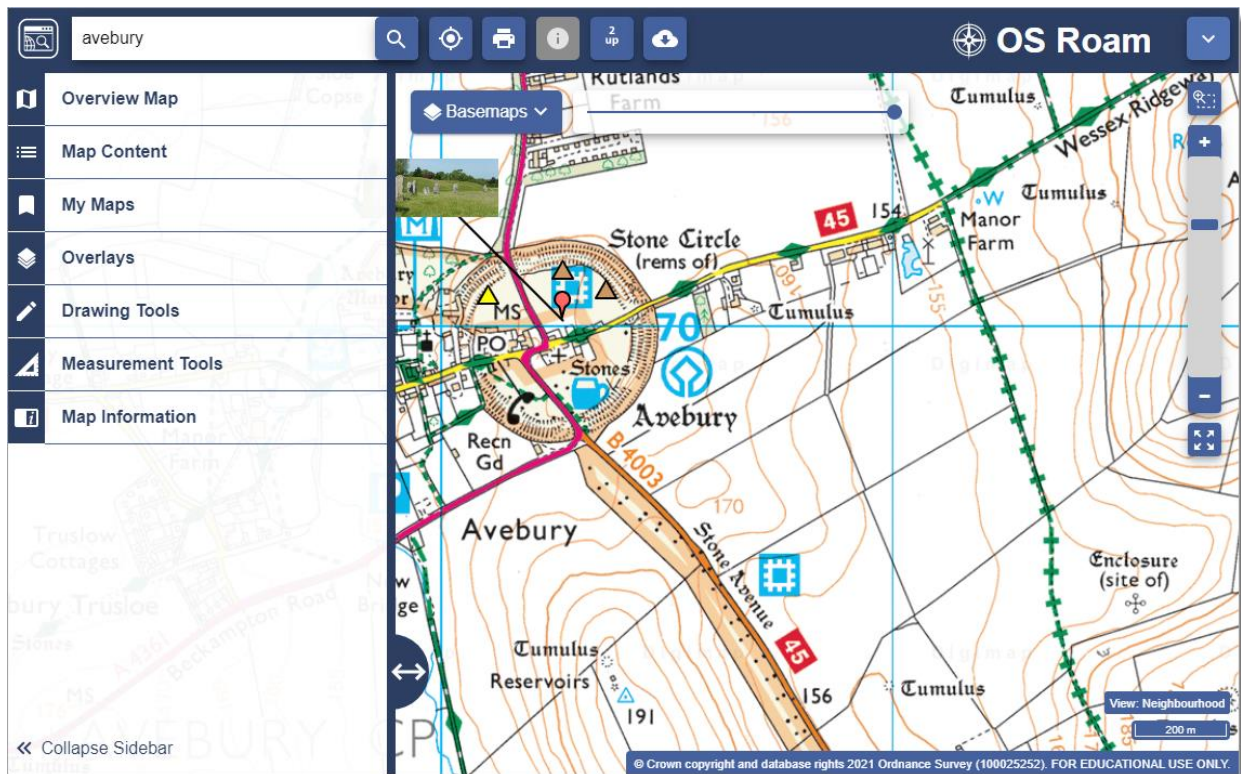


1. **Digimap Roam:** online viewing and printing
2. **Data Download:** download data for use in GIS/CAD/other software
3. **Web Services** (Web Map Services): stream data directly in to GIS software

## 2.1. Digimap Roam

In Digimap Roam you can view, customise and print maps. All Roam applications work in the same way but some offer additional features to make the most of their particular maps. You can:

- select your area of interest by searching, or zooming and panning
- view maps at one of our pre-defined scales
- annotate maps with symbols, lines, polygons and labels using drawing tools
- add buffer zones
- measure map features
- print maps at A4 to A0 size in PDF, PNG or JPG format
- customise map feature display
- select a different basemap
- compare 2 maps
- search for and add WMS layers



Here, we look at the 3 key areas of Roam and the tools within each area.

### 2.1.1. Map window

The main area of Roam is the map window, where you zoom in/out, move around the maps and can often change basemap.

- A scale bar is available to help you zoom in/out of the different map views.
- Map view names are displayed at the bottom right of the map window.
- Basemap selection is available on the map window in several, but not all, collections.
- A map opacity slider bar is available in some collections, to allow you to adjust the transparency of the maps.

### 2.1.2. Sidebar

The sidebar, on the left of Roam, contains several tools, including:

- Map content - depending on the collection, you may be able to select which map features you wish to display.
- Drawing Tools, which allow you to add text, symbols, shapes and buffers.
- Measurement tools to measure distance and area.
- Map information where you find coordinate information and details of the map data you are viewing.
- Overlays - depending on the collection, you may be able to add an overlay such as hillshading to your map window.
- Overview map, where you can check the area covered by your current map window.
- MyMaps, where you save maps.



### 2.1.3. Top toolbar

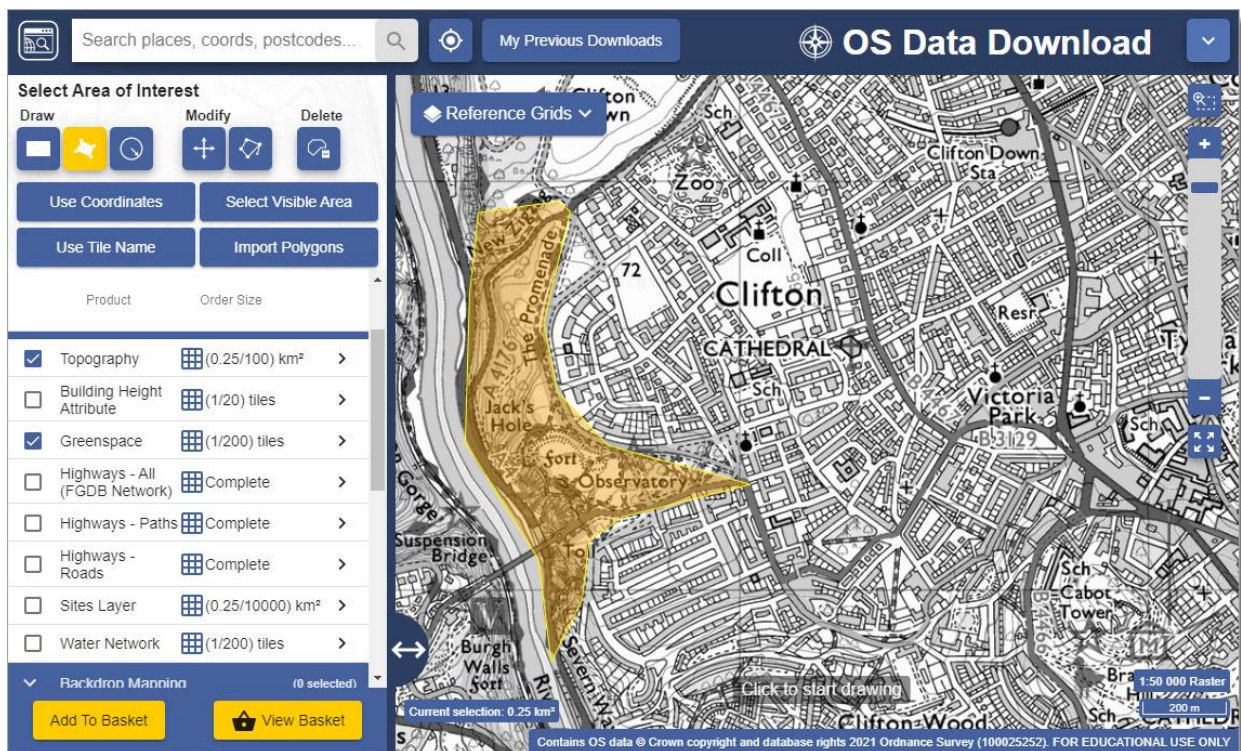
The toolbar above the map window has some key features, including:

- Search box - search with place names, postcodes and coordinates.
- Locate position tool, which adds a marker to your current geographic location.
- Print menu.
- 2up tool - compare 2 maps.
- Get Feature information tool - query the map for additional information.
- Data Download link - this option opens Data Download at the location of your current map in Roam.

## 2.2. Digimap Data Download

Digimap Data Download tools allow you to download map data for use, for example, in GIS software or CAD software. They allow:

- selection of area of interest by drawing on the map, or with coordinates or National Grid tiles
- order multiple map data product(s) in one order
- data available in various formats (varies between products)
- amend and reorder any previous orders



Downloading data is a straightforward 4 step process.

#### Step 1 Select area

You must define your area on the map - several tools are available to help you do this including:

- draw an area on screen
- use tile names

- select the visible area displayed on screen
- import polygons if you already have GIS datasets covering the extend of your study area

### **Step 2** Select map data products

The next step is to select the map data products you require, from the categories on the left of Data Download.

### **Step 3** Your basket

Options vary between data products, but you may be able to select; version, format, theme and/or layers.

You will receive an email to confirm your order has been submitted.

### **Step 4** Download completed order

When your order is ready, Digimap Collections will send you a second email.

Select the download link in this email to access your data.

## 2.3. Digimap Web Services

See section 6.3 Web Map Services (WMS) below.



### 3. ArcGIS/ESRI

<https://livingatlas.arcgis.com>

ESRI have a large number of curated datasets that are regularly updated and available for use. To get access to the widest range of layers you will need an ArcGIS Online account. ArcGIS Online is online GIS platform from ESRI which includes access to the Living Atlas. Contact Software Services to request an account to access ArcGIS Online:

<https://www.ed.ac.uk/information-services/computing/desktop-personal/software/main-software-deals/arcgis>

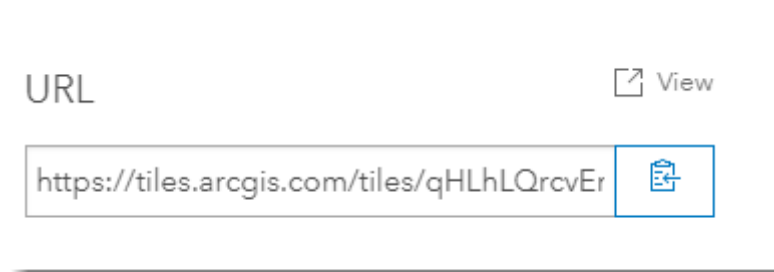
Note, there may be a charge for accessing ArcGIS Online depending which school you are studying at.

Whilst you will have access to more layers through an ArcGIS Online account, some layers within the Living Atlas can be viewed directly in QGIS without an ArcGIS Online account.

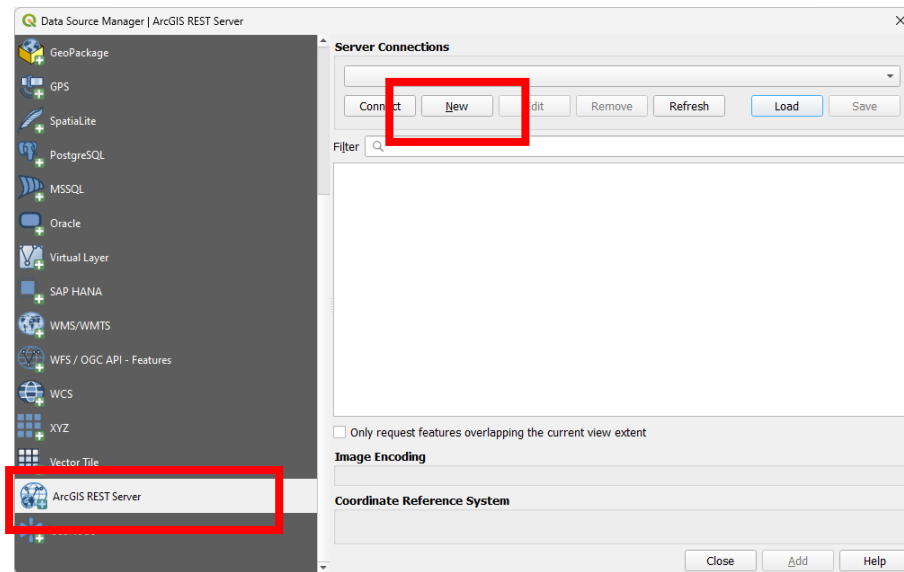
- from the main page, choose **Browse**
- select **United Kingdom** in the **All Regions** drop down to limit the search to UK datasets
- **Feature Layers** and **Tile Layers** can be added to QGIS, it is not possible to open other types at the moment (Web Maps, Map Images etc.). For these you would need to use an ESRI product such as ArcGIS Online.

#### 3.1. Adding Living Atlas Feature Layers to QGIS

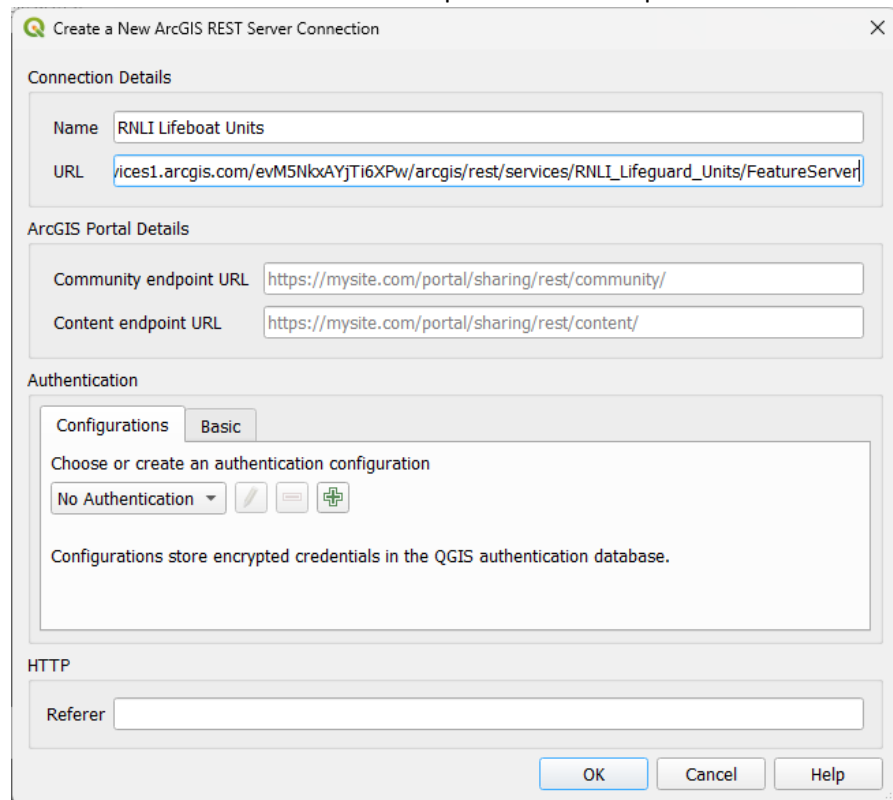
- Click on a **Feature Layer** to view the item details
- Copy the **URL** of the feature layer, this can be found on the right hand side of the page towards the bottom:



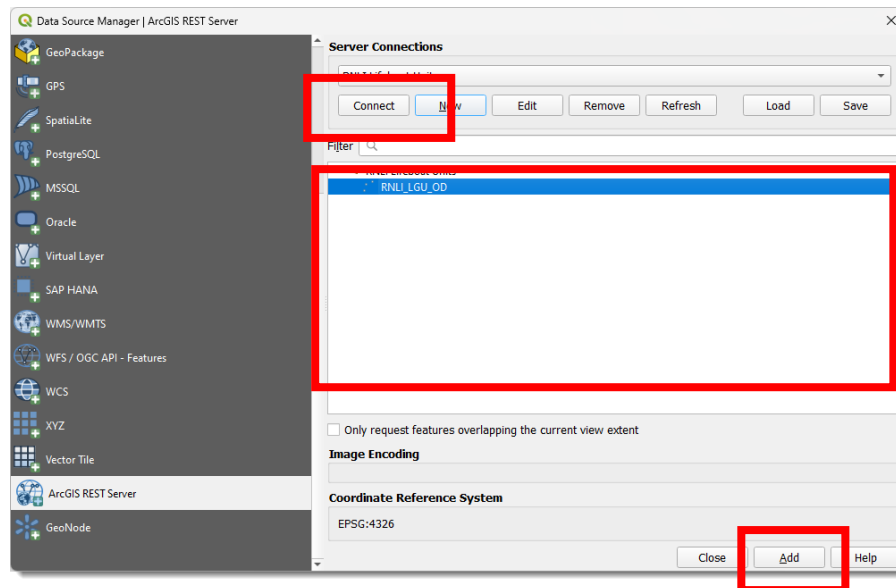
- In **QGIS** open the **Data Source Manager** and go to the **ArcGIS REST Server** tab:



- Click on the **New** button (highlighted above)
- Enter a suitable name in the **Name** field and paste the URL copied above in to the **URL** field:



- Click **OK** to close the window
- Click **Connect** to connect to this Feature Layer:

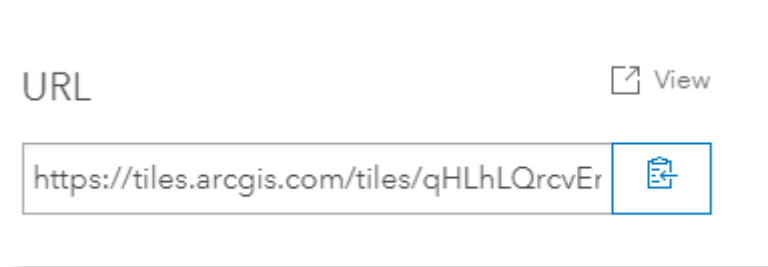


- This will populate the list of available layers in the Feature Layer highlighted above.
- Select the layers you wish to add and press the **Add** button.
  - **Note** you can add all layers to your map, or use the menu tree to just add specific layers.

### 3.2. Adding Living Atlas Tile Layers to QGIS

Adding a Living Atlas **Tile Layer** to QGIS is exactly the same as adding a Feature Layer:

- Click on a **Tile Layer** to view the item details
- Copy the **URL** of the tile service, this can be found on the right hand side of the page towards the bottom:



- In **QGIS** open the **Data Source Manager** and go to the **ArcGIS REST Server** tab
- Click on the **New** button
- Enter a suitable name in the **Name** field and paste the URL copied above in to the **URL** field
- Click **OK** to close the window
- Click **Connect** to connect to this Tile Layer
- This will populate the list of available layers in the Tile Layer
- Select the layers you wish to add and press the **Add** button
  - **Note** you can add all layers to your map, or use the menu tree to just add specific layers.

## 4. Open data portals

There are a variety of open data portals where you can search for datasets that are available for use.

- Portals can be a bit hit and miss as they often contain out of date links as websites are updated and portals reference old sites no longer available or maintained.
- Despite the name, 'open' data portals contain records that are restricted.

Open data portals contain a wealth of open data, not just map data so try searching for terms such as 'map' to limit the results returned to something which can be mapped.

There are usually a number of ways of accessing the data through data portals. These often include options to download the data in a variety of formats and also options to view the data in a table or on a map. For information on how to handle data published in 'WMS' format see section 6.3 Web Map Services (WMS).

Links to some common data portals are included in the following sections.

### 4.1. UK

<https://data.gov.uk> – comprehensive open data portal covering UK, search for 'flood'

<https://geoportal.statistics.gov.uk/> - Office for National Statistics (ONS) data portal contains lots of statistical data available for the UK.

<https://osdatahub.os.uk/downloads/open> - OS Open Data, note that this data can also be downloaded through Digimap.

### 4.2. Scotland

<https://SpatialData.gov.scot> – Spatial data hub

<https://www.opendata.nhs.scot/> - NHS Scotland

<https://statistics.gov.scot/> - Scottish Government Open Data Portal

<https://open-data-scottishforestry.hub.arcgis.com/> - Forestry Commission Scotland

<https://www.sepa.org.uk/environment/environmental-data> - Scottish Environment Protection Agency (SEPA)

### 4.3. England

<https://naturalengland-defra.opendata.arcgis.com/> - Natural England

<https://environment.data.gov.uk/> - Environment Agency

### 4.4. Wales

<https://lle.gov.wales/> - Natural Resources Wales

### 4.5. Map based lists of open data portals

There are also a couple of map based open data portals. As with the portals listed above these also contain a large number of broken links so should be used with caution.

<https://opendatainception.io/>

- Global
- Map has around 2600 records, list has just under 4000 records
- Focussed on Local Authority data portals in the UK
- Lots of broken links

<https://arcg.is/1Dr4y9>

- Based on above list

<https://dataportals.org/>

- 592 data portals
- Focussed on Local Authority data portals in the UK
- Lots of broken links

Note that with map based lists that data for Area X may be published in a portal in Area Y.



## 5. Free GIS datasets

### 5.1. OpenStreetMap (OSM)

OSM is the most detailed open data available across the world. There are a number of ways of downloading OSM data for use in GIS, the two most common ways are mentioned below.

#### 5.1.1. GeoFabrik

<https://download.geofabrik.de/>

The GeoFabrik website has a number of pre-prepared extracts of OSM data available for download, organised by geographic region. The extracts are updated on a regular basis so they are kept up to date with changes to the underlying OSM data. Data are available for download in a number of formats including PBF and ShapeFile, both of which can be read by QGIS. See section 8 Common Data Formats for further information on common data formats.

#### 5.1.2. QuickOSM

QuickOSM is a QGIS plugin that allows you to create custom queries and download specific features from OpenStreetMap that match your search criteria.

The following tutorial explains how to use QuickOSM to construct detailed queries to extract the data from OSM:

[https://www.qgistutorials.com/en/docs/3/downloading\\_osm\\_data.html](https://www.qgistutorials.com/en/docs/3/downloading_osm_data.html)

### 5.2. Natural Earth

<https://www.naturalearthdata.com/>

Natural Earth data has all the essential layers you need to create a map. The data includes administrative, hydrographic, and general land information at map scales of 1:10m, 1:50m, and 1:110m. The data is available to download in 'themes' in common GIS formats (including ShapeFile and Geopackage). A 'quick start kit' is also available containing a small sample of Natural Earth themes styled in in a QGIS document.

### 5.3. General data

There are a number of sites that have compiled lists of freely available GIS data. Whilst some of the datasets can be very niche they can still be useful resources for finding obscure datasets. The first list below is widely regarded as the best list available and is kept up to date by the author.

<https://freegisdata.rtwilson.com/>

<https://gisgeography.com/best-free-gis-data-sources-raster-vector/>

[https://en.wikipedia.org/wiki/List\\_of\\_GIS\\_data\\_sources](https://en.wikipedia.org/wiki/List_of_GIS_data_sources)

<https://sites.research.google/open-buildings/> - only Africa, South Asia and South-East Asia at the moment

<https://opentopography.org/> - focus on USA and New Zealand

<https://spatialreserves.wordpress.com/2019/02/18/the-top-10-most-useful-geospatial-data-portals-revisited/> - a list of the most useful data portals compiled by the ESRI US educational lead

## 5.4. Satellite imagery

<https://gisgeography.com/free-satellite-imagery-data-list/>

<https://eos.com/blog/free-satellite-imagery-sources/>

## 6. Backdrop mapping

Quite often you will require a basemap for your work. Some of the options covered above include links to basemaps e.g. ESRI's Living Atlas has a number of basemaps that can be added to QGIS via the instructions in section 3.2 Adding Living Atlas Tile Layers to QGIS.

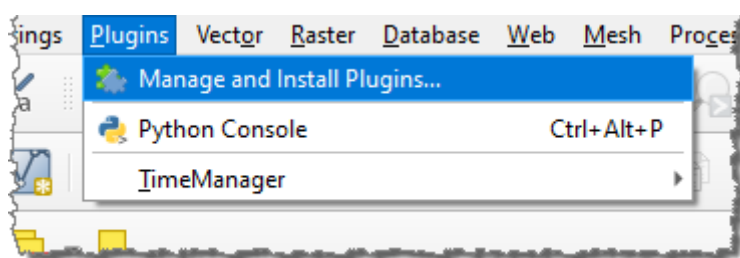
If your backdrop mapping looks distorted, it could be that the current Coordinate Reference System (CRS) of your project is different than that of the basemap. Most OpenStreetMap and Google Maps basemaps have been designed to display using the Pseudo-Mercator (or Web Mercator) CRS. See section 7 for details on how to change the CRS used in your QGIS project.

### 6.1. OpenStreetMap (OSM) in QGIS

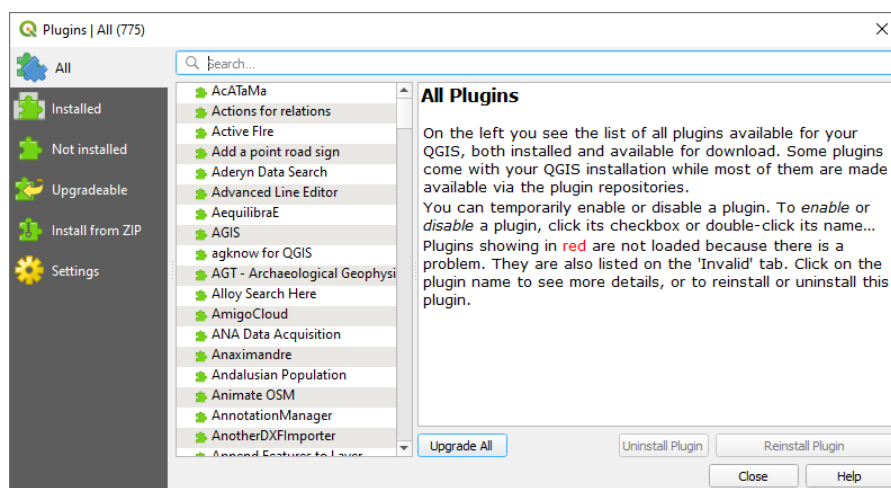
OpenStreetMap (<https://www.openstreetmap.org/>) is commonly used as a basemap as it is a global crowd sourced dataset that can be used for any purpose without restriction.

#### 6.1.1. Plugins

QGIS Plugins are the easiest way of pulling OSM data in to QGIS. Plugins are accessed through the Plugins > Manage and Install Plugins... menu in QGIS:



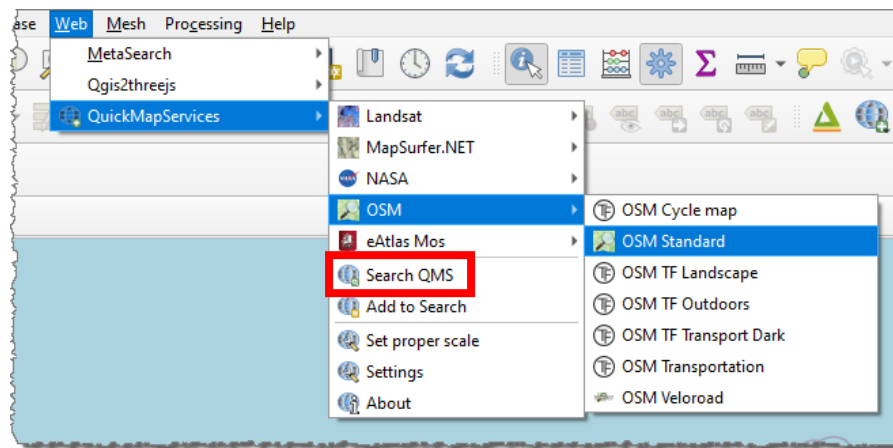
This will open the Plugins window where you can search for and install plugins as required:



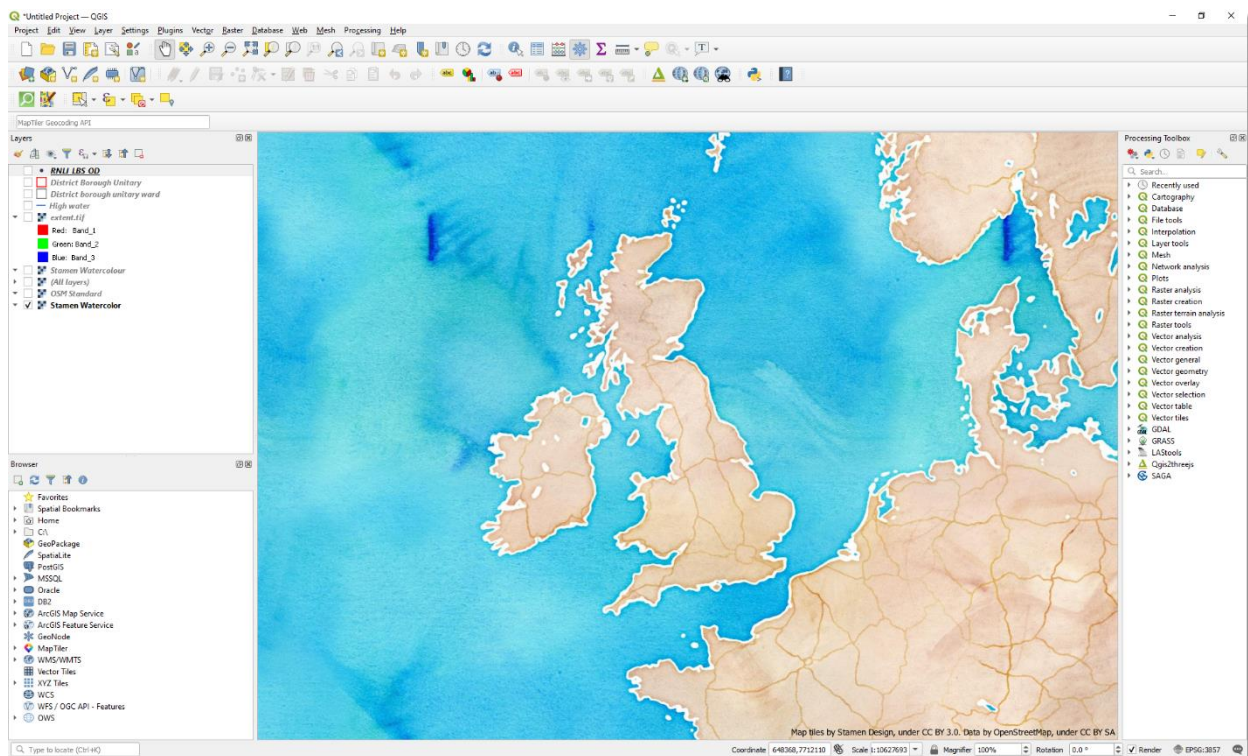
Good ones to install are **QuickMapServices** and **MapTiler**.

[QuickMapServices](#)

Once installed, QuickMapServices is accessed through the Web > QuickMapServices menu:

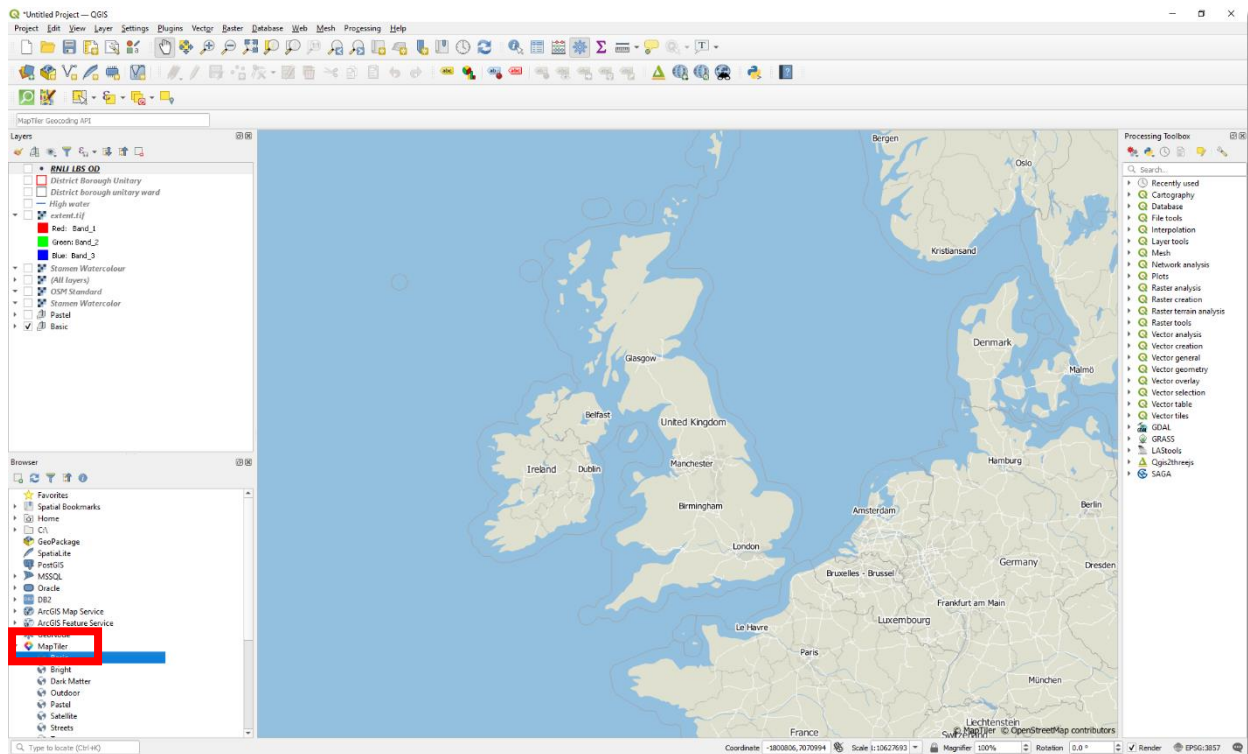


A number of default styles are shown and can be added by simply clicking on the relevant entry in the menu (e.g. OSM Standard). More styles are available through the Search QMS option (highlighted above). Good ones to try are the 'Stamen' styles such as Stamen Watercolour which displays OSM data in a watercolour style:

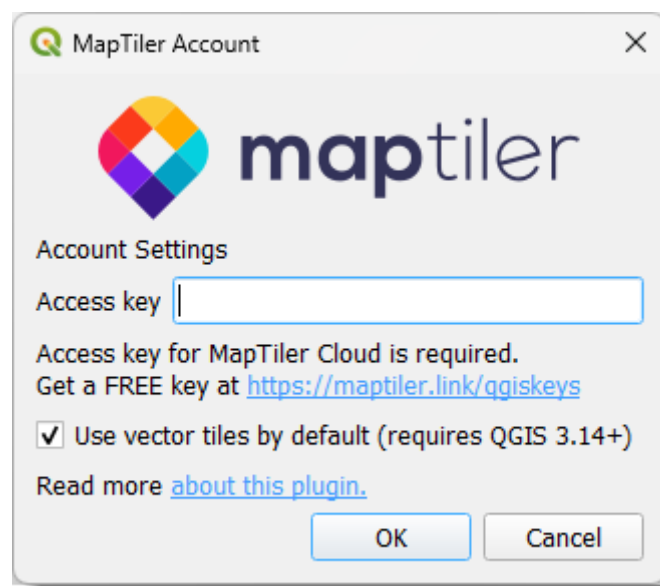


## MapTiler

The MapTiler plugin installs to the Browser window in QGIS:



To add a basemap using the MapTiler plugin you need to register for a free **Access Key**. Expand the MapTiler entry in the Browser panel and double click on the name of the basemap you wish to use, you will be prompted to enter your Access key:

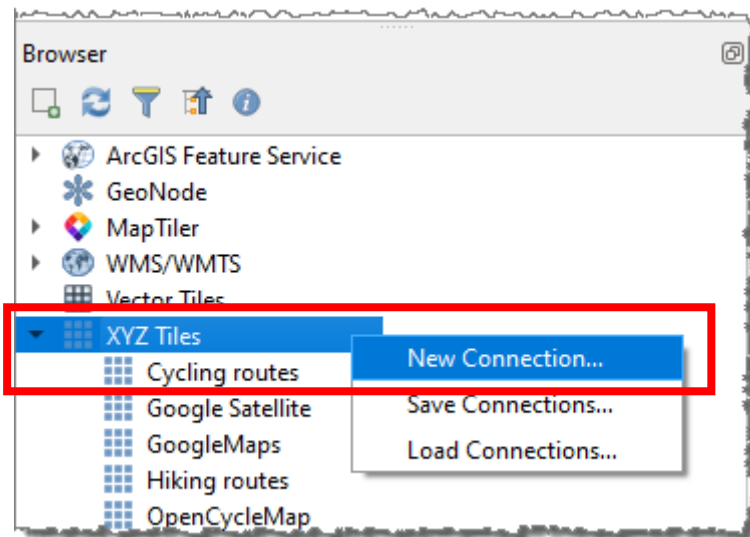


Use the link in the window to register for a free Access Key.

### 6.1.2. Alternative styles

As well as the styles available via the QuickMapServices and MapTiler plugins there are a number of other styles available that can be added through the XYZ Tiles function in QGIS. To access this, right click on the XYZ Tile entry in the Browser panel and select **New Connection**:





A list of available Raster Tile Servers can be found on the following page:

[https://wiki.openstreetmap.org/wiki/Raster\\_tile\\_providers](https://wiki.openstreetmap.org/wiki/Raster_tile_providers)

On this page a number of styles are shown, some are free, some are commercial and require registration. The information you need is the URL in the **tiles URL** column of the page:

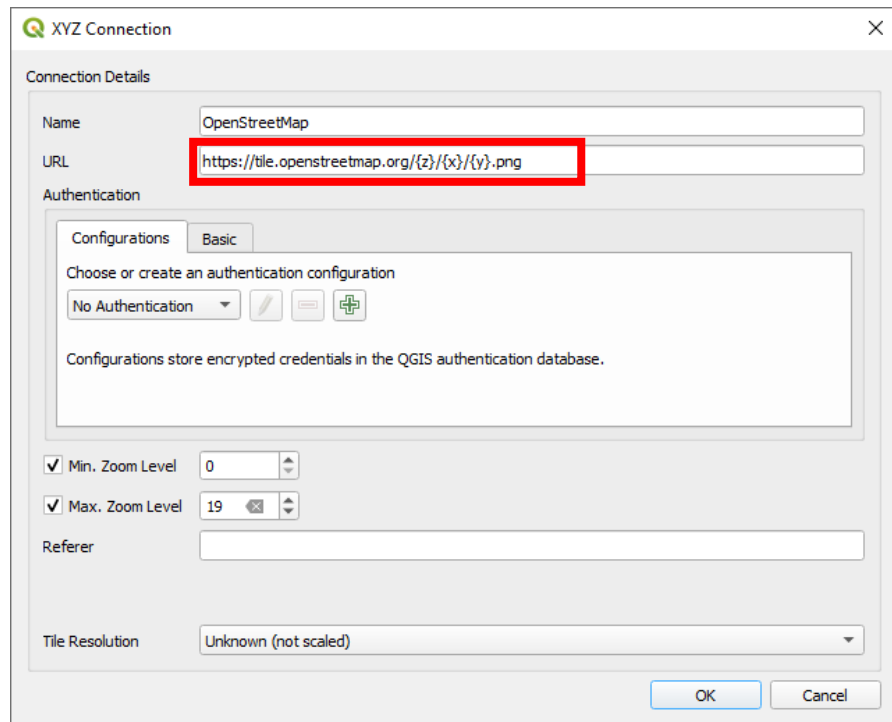
Name	free/commercial	latency	IPv6	comment	tiles url	Tile example	source code
OpenStreetMap's Standard tile layer <a href="https://openstreetmap.org">openstreetmap.org</a> front page <a href="#">Tile usage policy</a> <a href="#">compare</a>	free, funded by donations		yes		<a href="https://tile.openstreetmap.org/{z}/{x}/{y}.png">https://tile.openstreetmap.org/{z}/{x}/{y}.png</a>		<a href="https://github.com/gravitystorm/openstreetmap-carto/">https://github.com/gravitystorm/openstreetmap-carto/</a>
German fork of the Standard tile layer				label in German and local language (transliterated where not possible)	<a href="https://tile.openstreetmap.de/{z}/{x}/{y}.png">https://tile.openstreetmap.de/{z}/{x}/{y}.png</a>		

Copy the URL of the style you wish to use in QGIS, e.g.

<https://tile.openstreetmap.org/{z}/{x}/{y}.png> and paste it in to the URL field in QGIS.

**Important:** you must remove the '\$' symbols from the URL so the above URL becomes:

<https://tile.openstreetmap.org/{z}/{x}/{y}.png>



Give your XYZ Connection a name ('OpenStreetMap' in the screen grab above) and press OK.

To add this basemap to your map window double click on the relevant entry in the XYZ Tiles section in the Browser panel.

## 6.2. Google Maps in QGIS

Google Maps can be added to QGIS through the same XYZ Tiles functionality as described in section 6.1.2 above.

The URLs to use for the different map styles are shown in the table below.

Map Style	URL
Standard	<a href="https://mt1.google.com/vt/lyrs=r&amp;x={x}&amp;y={y}&amp;z={z}">https://mt1.google.com/vt/lyrs=r&amp;x={x}&amp;y={y}&amp;z={z}</a>
Satellite	<a href="http://www.google.cn/maps/vt?lyrs=s@189&amp;gl=cn&amp;x={x}&amp;y={y}&amp;z={z}">http://www.google.cn/maps/vt?lyrs=s@189&amp;gl=cn&amp;x={x}&amp;y={y}&amp;z={z}</a>
Satellite Hybrid	<a href="https://mt1.google.com/vt/lyrs=y&amp;x={x}&amp;y={y}&amp;z={z}">https://mt1.google.com/vt/lyrs=y&amp;x={x}&amp;y={y}&amp;z={z}</a>
Terrain	<a href="https://mt1.google.com/vt/lyrs=t&amp;x={x}&amp;y={y}&amp;z={z}">https://mt1.google.com/vt/lyrs=t&amp;x={x}&amp;y={y}&amp;z={z}</a>
Roads	<a href="https://mt1.google.com/vt/lyrs=h&amp;x={x}&amp;y={y}&amp;z={z}">https://mt1.google.com/vt/lyrs=h&amp;x={x}&amp;y={y}&amp;z={z}</a>

Further basemap options that can be added to QGIS using the same XYZ Tiles functionality are detailed on the following page:

<https://gis.stackexchange.com/questions/20191/adding-basemaps-from-google-or-bing-in-qgis>

## 6.3. Web Map Services (WMS)

Web Map Services allow you to stream data in to QGIS without needing to download it first. It is very similar to the way we added data from the ESRI Living Atlas in section 3 and how we added basemaps to QGIS using the XYZ Tiles functionality detailed in section 6.1.2. Generally speaking, WMS allow you to add individual layers to your QGIS project, rather than entire basemaps.

### 6.3.1. General WMS

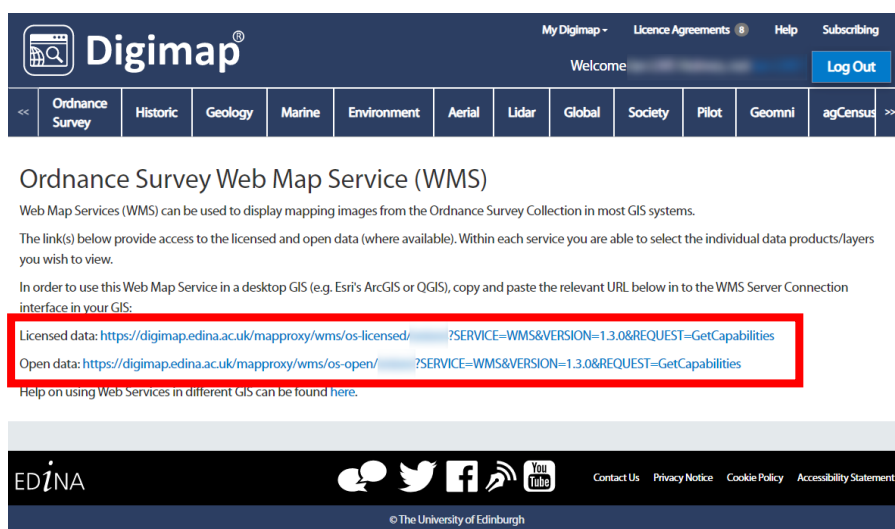
There are lots of WMS available that can be used in QGIS. Many of the data portals mentioned in section 3 include details of WMS and are a good place to start. Some additional ones are included in the table below.

Agency	URL	Comments
Scottish Government	<a href="https://spatialdata.gov.scot">https://spatialdata.gov.scot</a>	Search for 'urban rural classification'
British Geological Survey	<a href="https://www.bgs.ac.uk/technologies/web-map-services-wms/">https://www.bgs.ac.uk/technologies/web-map-services-wms/</a>	
Environment Agency	<a href="https://environment.data.gov.uk/">https://environment.data.gov.uk/</a>	Search for 'flood', select 'flood alert areas'

To add a WMS layer to QGIS you need to know the URL of the layer/group of layers.

### 6.3.2. Digimap WMS

The Web Services section of each collection in Digimap displays one or more URLs that can be used to access the data in the selected collection as a WMS. Where a Digimap collection contains both Open and Licensed data you will typically see two URLs; some collections only contain Licensed data so you will only see one URL.



The screenshot shows the Digimap website interface. At the top, there's a navigation bar with the Digimap logo and links for 'My Digimap', 'Licence Agreements', 'Help', and 'Subscribing'. Below this is a 'Welcome' message and a 'Log Out' button. A horizontal menu contains various categories: '<<', 'Ordnance Survey', 'Historic', 'Geology', 'Marine', 'Environment', 'Aerial', 'Lidar', 'Global', 'Society', 'Pilot', 'Geomni', 'agCensus', and '>>'. The main content area is titled 'Ordnance Survey Web Map Service (WMS)'. It explains that WMS can be used to display mapping images from the Ordnance Survey Collection in most GIS systems. It then provides two URLs for WMS access, both highlighted with a red box:

- Licensed data: <https://digimap.edina.ac.uk/mapproxy/wms/os-licensed/?SERVICE=WMS&VERSION=1.3.0&REQUEST=GetCapabilities>
- Open data: <https://digimap.edina.ac.uk/mapproxy/wms/os-open/?SERVICE=WMS&VERSION=1.3.0&REQUEST=GetCapabilities>

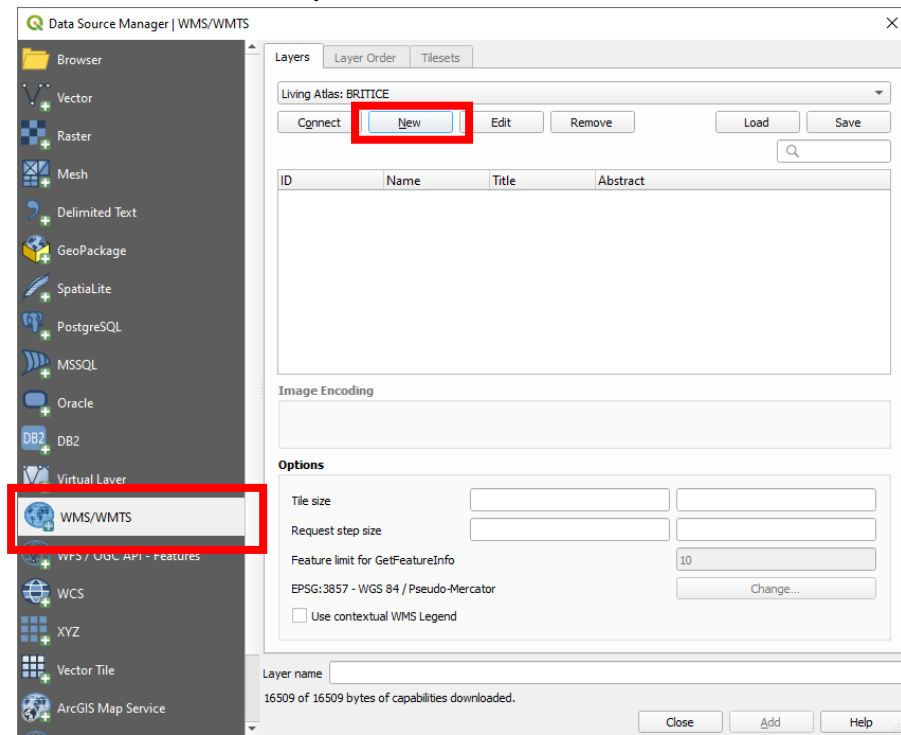
Below the URLs, there's a link to 'Help on using Web Services in different GIS can be found here.' At the bottom of the page, there's a footer with the EDINA logo, social media icons, and links for 'Contact Us', 'Privacy Notice', 'Cookie Policy', and 'Accessibility Statement'. The footer also includes the text '© The University of Edinburgh'.

**Note:** the URLs are unique to you and must not be shared with anyone else.

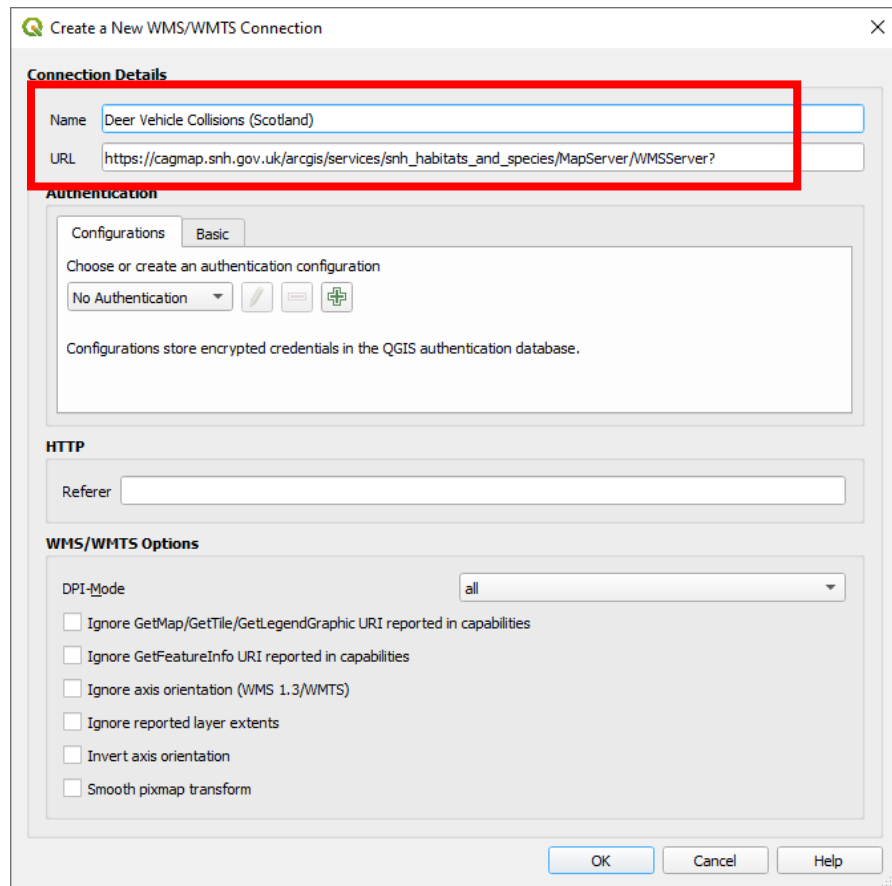
Scale dependency is set on all layers in Digimap so you may need to zoom in/out until you can see the data in QGIS.

### 6.3.3. Adding WMS to QGIS

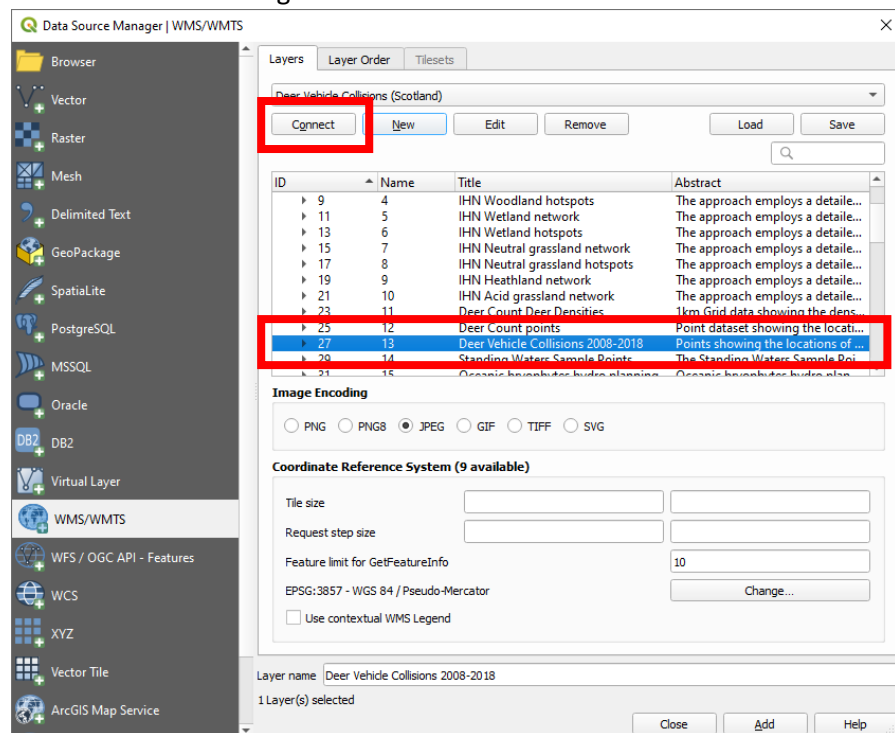
- Having found the URL of the WMS you wish to add to QGIS, open the **Data Source Manager** in QGIS and then select the **WMS/WMTS** tab:



- Click on the **New** button to open the **New Connection** window:

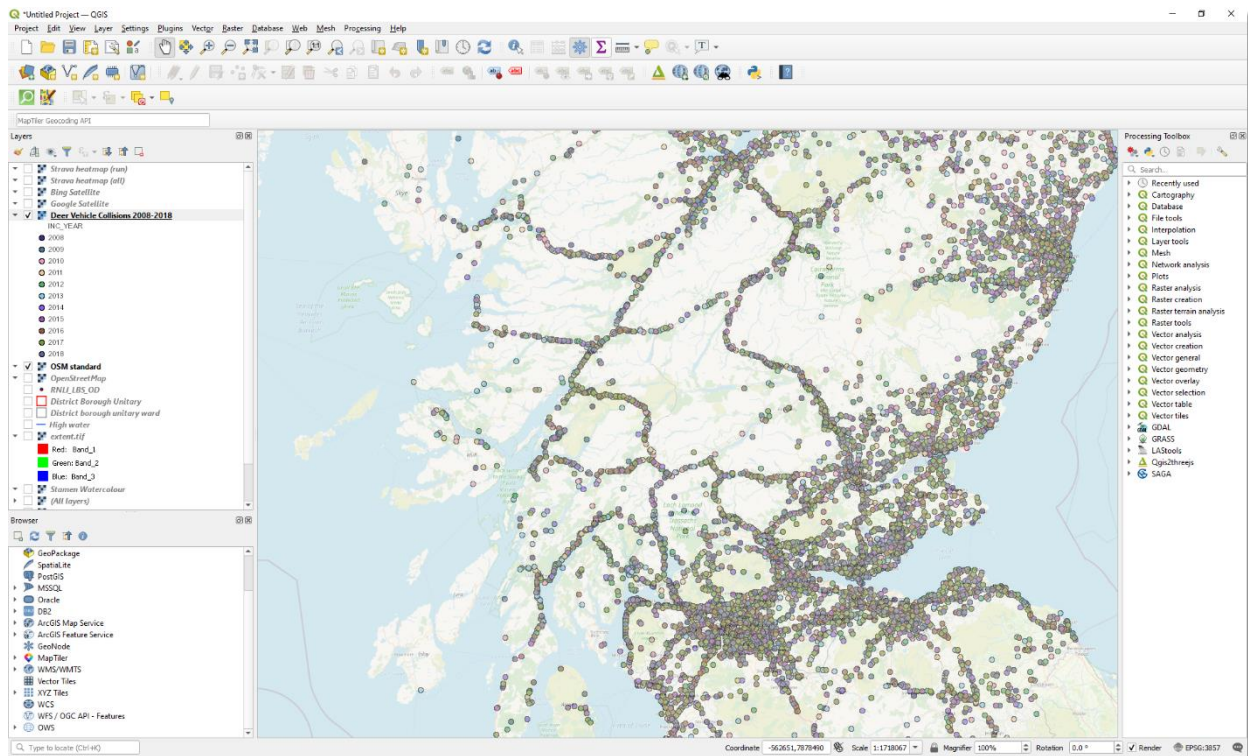


- Give your connection a suitable **Name** and paste the URL in to the **URL** field (shown above).
- Click the **OK** button.
- Back on the Data Source Manager window click on the **Connect** button:



- Select the layer(s) that you wish to add to the map and press the **Add** button.





**Note:** you may need to adjust the transparency of the WMS layer if it is fully opaque and obscuring your basemap.

## 7. A note about Coordinate Reference Systems (CRS)

### 7.1. Common projections

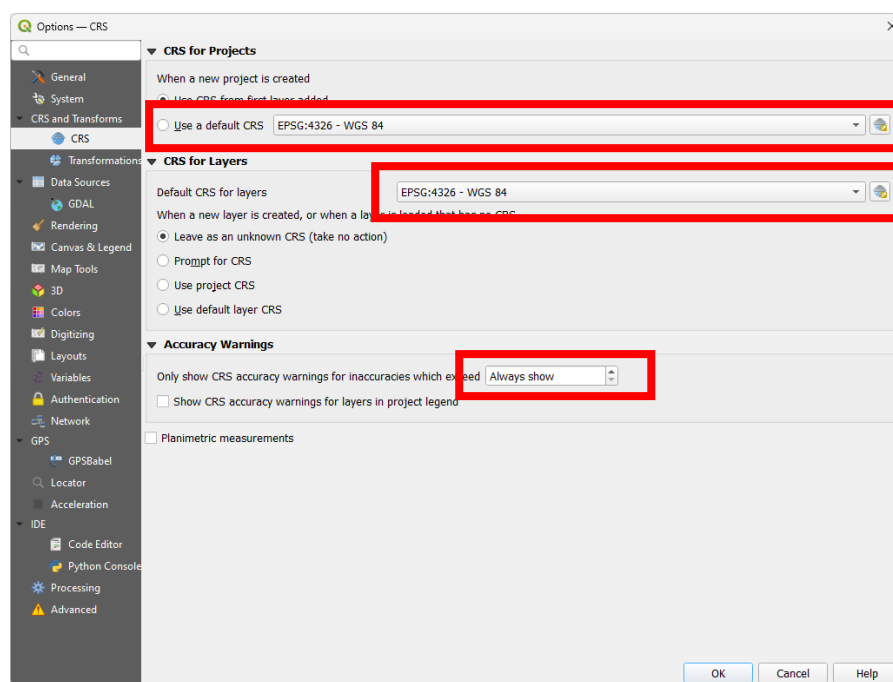
Geographic data is often *projected* so that real world data (i.e. 3D globe-based) is accurately drawn in two dimensions on a flat piece of paper or computer screen. When dealing with data for Great Britain you will typically encounter three Coordinate Reference Systems.

EPSG Code	CRS Name	Explanation
27700	British National Grid	Primary CRS used for Great Britain.
3857	Pseudo-Mercator or web mercator	Projection used in Google Maps and other online mapping platforms such as OpenStreetMap.
4326	WGS84	WGS84 is the reference system used by the Global Positioning System.

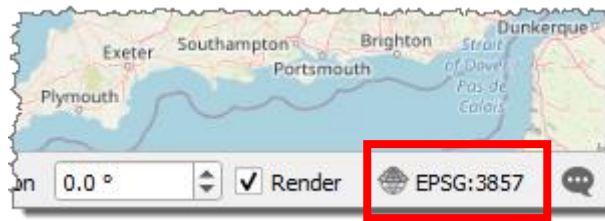
**Note:** EPSG stands for European Petroleum Survey Group who publish a database of coordinate system information plus some very good related documents on map projections and datums. (<https://epsg.io/>)

### 7.2. Setting projections in QGIS

QGIS will generally re-project datasets stored in different projections on-the-fly so that different layers are displayed in the correct location. By default QGIS will set the CRS of the project to match the CRS of the first layer added. You can override this behaviour and set a default CRS for all projects through the Settings > Options > CRS menu. The fields to change are highlighted below:



Within a QGIS project the current CRS is displayed in the bottom right hand corner of the main map window:



To change the CRS used in the current project, click on the area highlighted above and select an appropriate CRS from the window.

## 8. Common Data Formats

It is inevitable that you will encounter data in a number of different formats. The common ones are described below.

**CSV (Comma Separated Value)** - A widely used format for transferring data between different databases, commonly referred to as CSV format. Data is stored as simple text which can be imported in most database and GIS software and read in any text editor. Each value is enclosed in speech marks and each field separated by a comma. The end of a row of data is identified by a carriage return. The first line of the file usually contains the field names; the remaining lines contain the data.

**GeoJSON** - GeoJSON is an open standard format designed for representing simple geographical features, along with their non-spatial attributes. It is based on the JSON format.

**GML (Geographic Markup Language)** - GML has been designed by the OpenGIS Consortium (OGC) to provide an open spatial data schema to enable interoperability between independent GIS applications and with internet GIS in mind.

**GPKG (GeoPackage)** - A GeoPackage is an open, non-proprietary, platform-independent and standards-based data format for geographic information system implemented as a SQLite database container.

**GDB or FGDB (ESRI File Geodatabase)** - A file geodatabase is a modern way of storing and managing spatial and non-spatial data.

**KML (Keyhole Markup Language)** - KML is an XML notation for geographic information and enables two-dimensional maps and three-dimensional visualisation of features. KML was developed for use with Google Earth.

**PBF (Protocolbuffer Binary Format)** - PBF is a space efficient way of transferring large volumes of data and it is used for OpenStreetMap data.

**SHP (ESRI Shapefile Format)** - A widely used format for vector data. A shapefile comprises a collection of files with \*.shp, \*.shx, \*.dbf representing core extensions. Shapefiles describe spatial geometries comprising points, polylines or polygons which represent various features displayed in a Geographical Information System (GIS).

**WMS (Web Map Services)** - WMS is not a data format but a standard that describes how data can be retrieved and displayed in a GIS client.

## 9. Final thoughts

### 9.1. Use Google

Google search can be a useful way of finding data. Include things like 'spatial data', 'shapefile', 'map', 'download' in your search terms to try and limit the search to spatial data.

### 9.2. Ask questions

You should always critically question any GIS data you obtain and use, whether from the internet or any other source. For example, you should ask where data came from, who produced it, what errors or omissions it might contain, and so on. Don't take it at face value that the data you have found is 100% accurate. Look for metadata and other information about the dataset so you are fully aware of any errors or limitations in using it.

### 9.3. Check licence conditions

Nearly all data, including Open Data, have some limitations on how the data can be used. You should always, always, always include an appropriate copyright statement. Check the licence conditions of each dataset to ensure you use an appropriate copyright statement.

If in doubt, ask the original data provider.